

Applicant : Bin Zhao  
Application No. : 09/876,368  
Filed : 06/07/2001  
Title : INTERLEAVER USING SPATIAL BIREFRINGENT  
ELEMENTS

Grp./Div. : 2872  
Examiner : CRAIG H.CURTIS

Client/Customer No. : 00CV006

**LETTER + AMENDED CLAIMS**

**NEW ADDRESS: 14 Figaro  
Irvine, CA 92606**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Attn: Craig H. Curtis

Dear Craig:

As we discussed in our phone interview conversation this morning, the existing claims 25-33 are not quite appropriate for the instant patent application. I would like to cancel claims 25-33 and respectfully submit new claims 34-57 for your examination. The new claims 34-57 are almost the same as the original claims 1-24, where new claim numbers are used wherever they are appropriate.

The original patent agent/attorney, Mr. Norman Carte, for the instant patent application is not on the record of this patent application anymore. I am the inventor of this application to make this request.

Thank you very much for your consideration.

Respectfully submitted,

Bin Zhao  
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### **Amended Claims**

Claims 1-24 (previously cancelled)

Claims 25-33 (cancelled)

Claim 34 (new): An interleaver comprising:

- an input polarization beam displacer;
- a birefringent filter assembly in optical communication with the input polarization beam displacer, the birefringent filter assembly comprising at least one birefringent filter stage, each birefringent filter stage comprising:
  - a first filter polarization beam displacer; a second filter polarization beam displacer; at least one reflector configured direct light from the first filter polarization beam displacer to the second filter polarization beam displacer;
  - a first output polarization beam displacer in optical communication with the birefringent filter assembly;
  - and a second output polarization beam displacer in optical communication with the first output polarization beam displacer.

Claim 35 (new): The interleaver as recited in claim 34, wherein the reflector(s) comprise prisms.

Claim 36 (new): The interleaver as recited in claim 34, wherein the reflector(s) comprise mirrors.

Claim 37 (new): The interleaver as recited in claim 34, wherein the reflector(s) comprise two reflectors.

Claim 38 (new): The interleaver as recited in claim 34, wherein:

- the birefringent filter stage(s) define first and second paths; the reflector(s) comprise a single prism;

and further comprising a material disposed in at least one of the first and second paths, the material having an index of refraction which causes the first and second paths to have different optical path lengths.

Claim 39 (new): The interleaver as recited in claim 34, wherein:

each birefringent filter stage further comprises at least a half-wave waveplate intermediate each reflector and the first or the second filter polarization beam displacer.

Claim 40 (new): The interleaver as recited in claim 34, wherein:

each birefringent filter stage further comprises at least a half-wave waveplate disposed intermediate each reflector and the first or the second filter polarization beam displacer, each half-wave waveplate having an optical axis thereof oriented at approximately  $45^\circ$  with respect to a +x axis at that location.

Claim 41 (new): The interleaver as recited in claim 34, further comprising:

a first input half-wave waveplate disposed intermediate the input polarization beam displacer and the birefringent filter assembly and configured so as to transmit a non-displaced beam therethrough;

and a second input half-wave waveplate disposed intermediate the input polarization beam displacer and the birefringent filter assembly and configured so as to transmit a displaced beam therethrough.

Claim 42 (new): The interleaver as recited in claim 34, further comprising:

a first input half-wave waveplate disposed intermediate the input polarization beam displacer and the birefringent filter assembly and configured so as to transmit a non-displaced beam therethrough, the first input half-wave waveplate having an optic axis thereof oriented at approximately  $22.5^\circ$  with respect to a +x axis at that location;

and a second input half-wave waveplate disposed intermediate the input polarization beam displacer and the birefringent filter assembly and configured so as to transmit a displaced beam therethrough, the second input half-wave waveplate having an optic axis-thereof oriented at approximately  $-22.5^\circ$  with respect to a +x axis at that

location.

Claim 43 (new): The interleaver as recited in claim 34, further comprising at least a half-wave waveplate configured to receive an output of each birefringent filter assembly.

Claim 44 (new): The interleaver as recited in claim 34, further comprising:

a half-wave waveplate configured to receive an output of a birefringent filter assembly, the half-wave waveplate having an optical axis angle of approximately  $-22.5^\circ$  with respect to the +x axis at that location.

Claim 45 (new): The interleaver as recited in claim 34, further comprising:

a half-wave waveplate of a first stage thereof configured to receive an output of a birefringent filter assembly, the half-wave waveplate having a optical axis angle of approximately  $-33^\circ$  with respect to the +x axis at that location;

and a half-wave waveplate of a second stage thereof configured to receive an output of a birefringent filter assembly, the half-wave waveplate having a optical axis angle of approximately  $10.5^\circ$  with respect to the +x axis at that location.

Claim 46 (new): The interleaver as recited in claim 34, further comprising:

a half-wave waveplate of a first stage thereof configured to receive an output of a birefringent filter assembly, the half-wave waveplate having a optical axis angle of approximately  $-33^\circ$  with respect to the +x axis at that location;

a half-wave waveplate of a second stage thereof configured to receive an output of a birefringent filter assembly, the half-wave waveplate having a optical axis angle of approximately  $14^\circ$  with respect to the +x axis at that location;

and a half-wave waveplate of a third stage thereof configured to receive an output of a birefringent filter assembly, the half-wave waveplate having a optical axis angle of approximately  $-3.5^\circ$  with respect to the +x axis at that location.

Claim 47 (new): The interleaver as recited in claim 34, further comprising:

a first half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer;

a second half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer;

a third half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer;

and a fourth half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer.

Claim 48 (new): The interleaver as recited in claim 34, further comprising:

a first half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer, the first half-wave waveplate having an optic axis orientation of approximately  $0^\circ$  with respect to the +x axis at that location;

a second half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer, the second half-wave waveplate having an optic axis orientation of approximately  $45^\circ$  with respect to the +x axis of that location;

a third half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer, the third half-wave waveplate having an optic axis orientation of approximately  $45^\circ$  with respect to the +x axis at that point;

and a fourth half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer, the fourth half-wave waveplate having an optic axis orientation of approximately  $90^\circ$ .

Claim 49 (new): The interleaver as recited in claim 34, wherein the birefringent filter assembly comprises one birefringent filter stage.

Claim 50 (new): The interleaver as recited in claim 34, wherein the birefringent filter assembly comprises a plurality of birefringent filter stages.

Claim 51 (new): The interleaver as recited in claim 34, wherein the birefringent filter assembly comprises two birefringent filter stages.

Claim 52 (new): The interleaver as recited in claim 34, wherein the birefringent filter assembly comprises three birefringent filter stages.

Claim 53 (new): The interleaver as recited in claim 34, wherein:

the filter polarization beam displacers and the reflector[s] of each birefringent filter stage define two light paths wherein a difference in the first and second optical path lengths is provided by a material having an index of refraction greater than one which is disposed within at least a portion of one of the first and second paths.

Claim 54 (new): The interleaver as recited in claim 34, wherein:

the filter polarization beam displacers and the reflector[s] for each birefringent filter stage define two light paths wherein an index of refraction is different for at least a portion of the first and second paths, so as to cause the first and second paths to have different optical lengths.

Claim 55 (new): The interleaver as recited in claim 34, wherein:

the input polarization beam displacer, the birefringent filter assembly, the first output polarization beam displacer and the second output polarization beam displacer are configured so as to facilitate interleaving of a plurality of beams simultaneously.

Claim 56 (new): The interleaver as recited in claim 34, wherein:

the input polarization beam displacer, the birefringent filter assembly, the first output polarization beam displacer and the second output polarization beam displacer are configured so as to facilitate interleaving of a plurality of linearly arrayed beams simultaneously.

Claim 57 (new): The interleaver as recited in claim 34, wherein the interleaver channels have spacing which is tunable.

## Curtis, Craig

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**From:** zhaob2001@yahoo.com  
**Sent:** Thursday, March 11, 2004 4:29 PM  
**To:** Curtis, Craig  
**Subject:** Application 09/876,368



09876368-040311.doc

Dear Craig,

Please consider my request in the attached file for Patent Application 09/876,368. Once you receive this email, please give me a response (a quick reply to this email) so that I don't need to continue check whether you get this email or not.

Thank you very much.

Best regards,

Bin Zhao / (949) 266-6800

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